Energy loss characteristics of Neolith-s

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Abstract

Material list and energy loss characteristics of the tracking section of Neolith-s are described.

1 Material list

The side view of Neolith-s is shown in Fig. 1. The list of materials of Neolith-s is given in Table 1. The thickness of the front converter and rear catcher scintillators was assumed to be 6 cm.

2 Energy loss characteristics of protons inside Neolith-s

Energy development of protons with energies of 20, 30, and 40 MeV inside Neolith-s (but excluding the front converter scintillator) is shown in Fig. 2. Similar results for the 50, 70, 100, 150, 200-MeV protons are shown in Fig. 3. Calculations were done with the ELOS code [1].

It is seen that protons impinging on the tracking section of Neolith-s with an energy of 20 MeV or less do not reach the rear scintillator, while those with an energy of around 100 MeV or above can punch through the rear scintillator.

References

[1] Bethe-Bloch formula for heavy ions (Y.Satou).

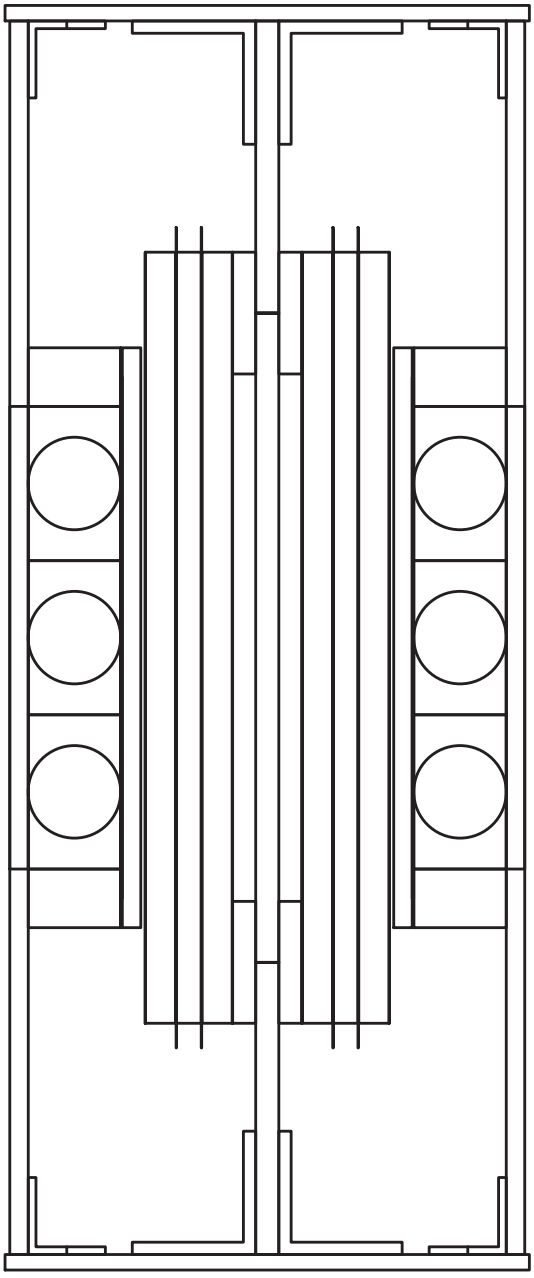

Figure 1: Side view of the Neolith-s setup.

Table 1: Material list of Neolith-s (pattern 3). Converter scintillator is excluded together with the paper honeycomb. Distance refers to the length measured from the front surface of the first material to the rear surface of each material.

#	material	data_material file name	thickness (cm)	distance (cm)	misc.
	End of the converter scintillator section			0.0000	
1	vinylchloride	vinylchloride.dat	0.005	0.0050	
2	air	air.dat	1.577	1.5820	
3	Al	aluminum.dat	0.004	1.5860	
4	GFRP	G10_FR4.dat	0.02	1.6060	
5	air	air.dat	1.96	3.5660	
6	GFRP	G10_FR4.dat	0.02	3.5860	
7	FR4	G10_FR4.dat	0.03	3.6160	
8	Cu	Cu.dat	0.0018	3.6178	Cathode
9	Ar	Ar.dat	1.27712	4.8949	Ar in P20
10	CH4	CH4.dat	0.31928	5.2142	CH4 in P20
11	Cu	Cu.dat	0.0018	5.2160	Cathode
12	FR4	G10_FR4.dat	0.03	5.2460	
13	GFRP	G10_FR4.dat	0.02	5.2660	
14	air	air.dat	1.96	7.2260	
15	GFRP	G10_FR4.dat	0.02	7.2460	
16	Al	aluminum.dat	0.004	7.2500	
17	air	air.dat	4.5	11.7500	
18	Al	aluminum.dat	0.004	11.7540	
19	GFRP	G10_FR4.dat	0.02	11.7740	
20	air	air.dat	1.96	13.7340	
21	GFRP	G10_FR4.dat	0.02	13.7540	
22	FR4	G10_FR4.dat	0.03	13.7840	
23	Cu	Cu.dat	0.0018	13.7858	Cathode
24	Ar	Ar.dat	1.27712	15.0629	Ar in P20
25	CH4	CH4.dat	0.31928	15.3822	CH4 in P20
26	Cu	Cu.dat	0.0018	15.3840	Cathode
27	FR4	G10_FR4.dat	0.03	15.4140	
28	GFRP	G10_FR4.dat	0.02	15.4340	
29	air	air.dat	1.96	17.3940	
30	GFRP	G10_FR4.dat	0.02	17.4140	
31	Al	aluminum.dat	0.004	17.4180	
32	air	air.dat	1.577	18.9950	
33	vinylchloride	vinylchloride.dat	0.005	19.0000	
34	plastic	plastic.dat	6.0	25.0000	

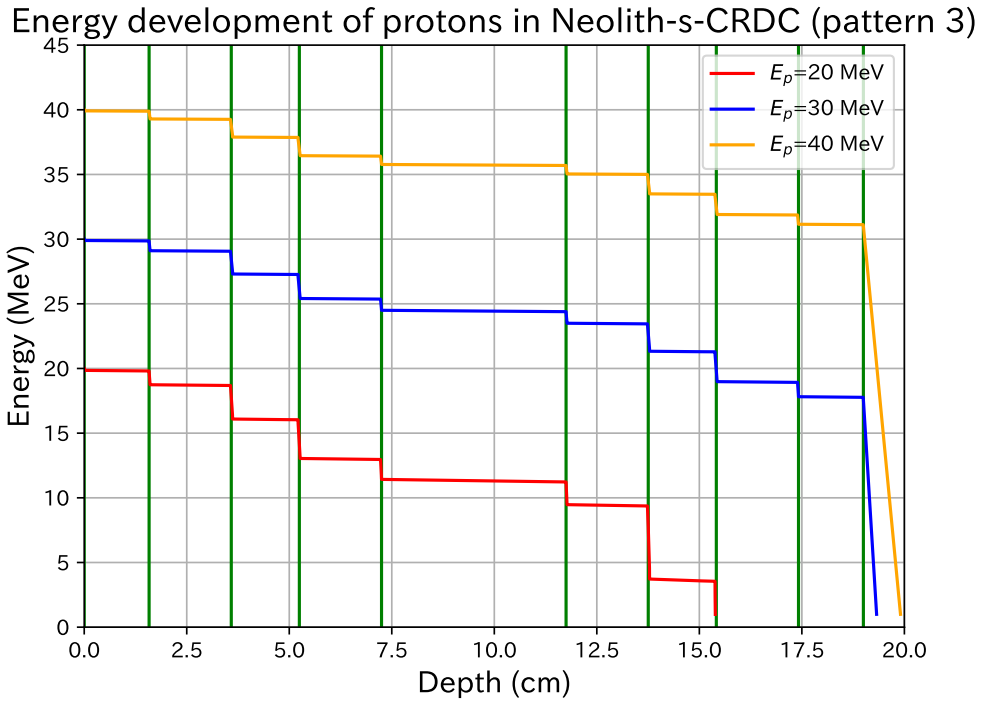

Figure 2: Energy development of protons with energies of 20, 30, and 40 MeV inside the Neolith tracking sections and the rear catcher plastic scintillator.

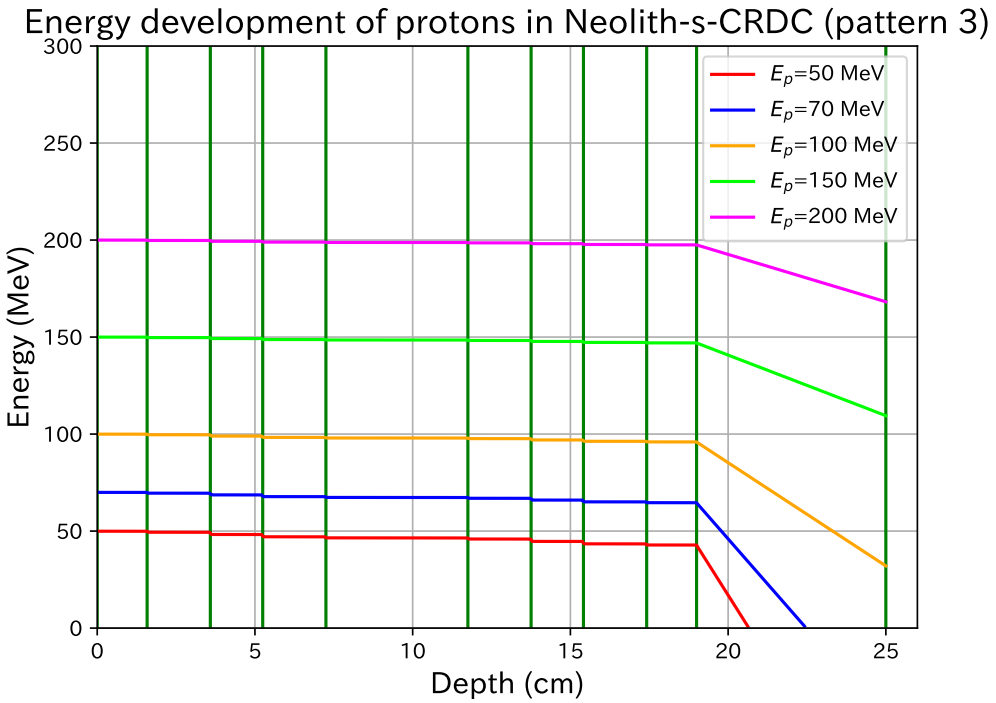

Figure 3: Same as Fig. 2 but for proton energies of 50, 70, 100, 150, and 200 MeV.